ANALECTA PRAEHISTORICA LEIDENSIA

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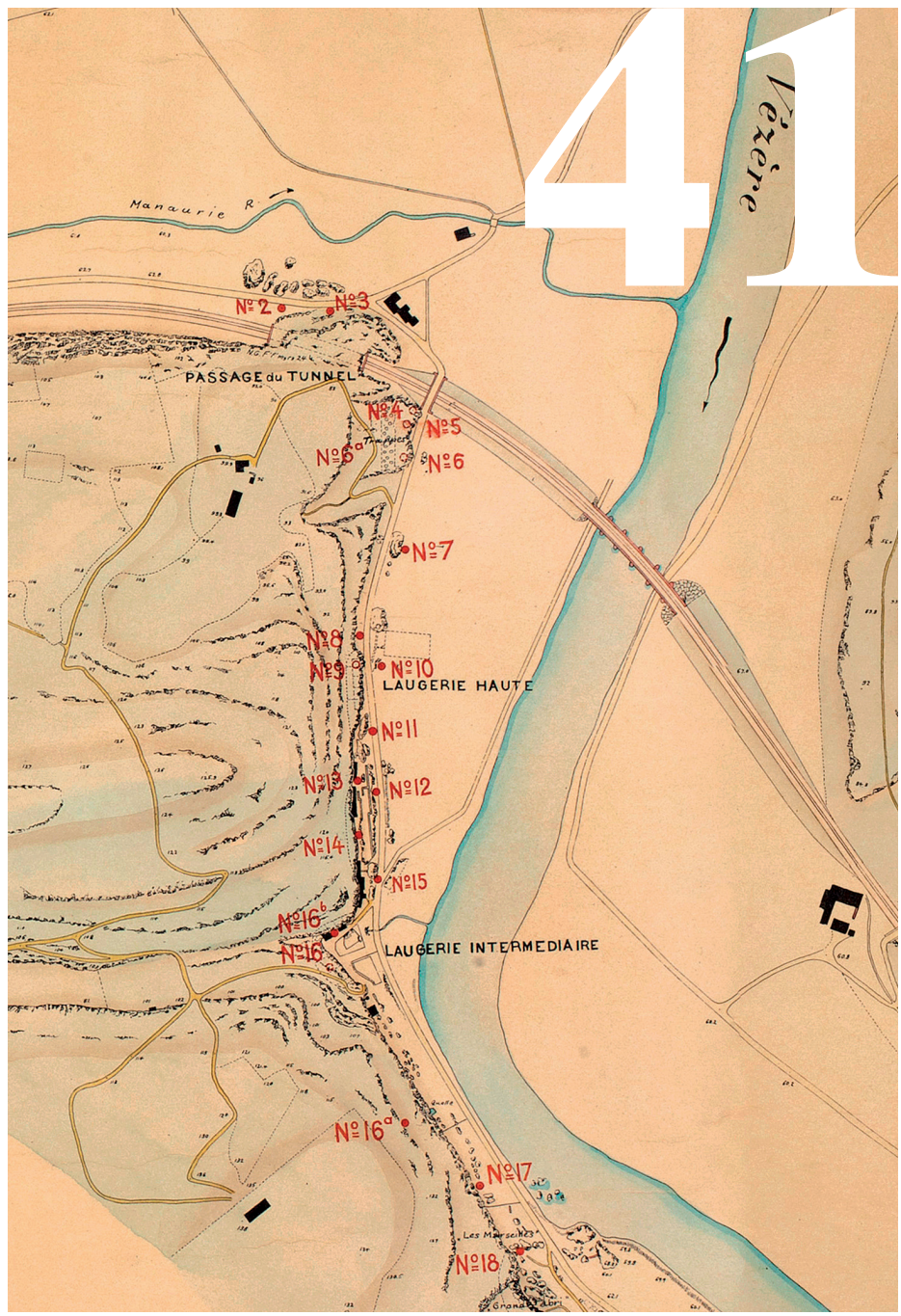

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Contents

Crops grown on the sandy soils of Eastern Brabant (the Netherlands) before, during and after the Roman occupation

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*Discussed is the effect of Roman occupation, and its subsequent disappearance after some 250 years, on the crops grown by native farmers living on the sandy soils of Eastern Brabant. The Romans introduced the cultivation of beet (*Beta vulgaris*). Other crop plants may have been introduced as well, but, probably due to taphonomic problems, such plants have not been found. The other newcomers retrieved during excavations: dill* (Anethum graveolens*), celery (*Apium graveolens*), coriander (*Coriandrum sativum*), parsley (*Petroselinum crispum*), savory (*Satureja hortensis), *plum (*Prunus domestica *var.* insititia*) and walnut (*Juglans regia*) were only found in connection with higher-status dwellings and may have been imported. It is not certain that the owners of such farms did grow them in their own gardens. Another change is that the rural population left more remains of wild fruits and nuts, which is interpreted as an indication of an increased importance of gathering, possibly due to the relative shortage of men to do heavy farm work. Many men would have left to serve in the Roman army.*

*The disappearance of Roman rule brought the arrival of Germanic people and with them a new cereal: rye (*Secale cereale*). Rye must have been part of Germanic culture. The 'Roman' vegetables, fruits and condiments remained.*

Analysis of carbonized harvests showed that crops were grown as monocrops. The existence of maslins could not be demonstrated. The weeds in the harvests are indicative of poor, acid soils.

1 Introduction

For many years archaeologists of Leiden University have carried out excavations in the eastern part of the province of Noord-Brabant (the Netherlands). From 1996 onwards the private firm Archol, associated with Leiden University and founded to carry out contract research, was and still is active in the same region. Others, for instance the University of Amsterdam and the Free University of Amsterdam, have been digging there as well.

A considerable part of the excavations was devoted to rural settlements, consisting of traces of farmhouses, granaries and other outhouses, pits, wells and an occasional fence. Almost all structures above ground were built in wattle-and-daub which does not withstand decay, and only postholes, pits, wells and other features dug into the subsoil will have been left to be discovered today. They appear as discolorations in the subsoil because they were, intentionally or not, filled in with a dark-coloured sediment which stands out against the lighter background. The difference in colour is attributable to a difference in pollution with organic substances. Exceptions to this general picture are provided by one or two farmhouses erected in the Roman period after a Roman style of building which implied the use of stone and brick in its lower parts.

Many of the excavated sites date back to the Middle to Late Iron Age, Roman period and Early and High Middle Ages. This is the period 500 BC – AD 1250. During this long stretch of time two important events took place which left their marks in the region. The first was the arrival of the Roman army of occupation around 19 BC and the subsequent incorporation of the region in the Roman Empire. The regions northern and eastern limits became part of the Roman frontier, the so-called *limes*. The second event was the collapse of Roman rule, which in this region set in halfway the 3rd century AD. By and by authority was taken over by Germanic tribes which had crossed the *limes*, first by invitation and later on their own initiative. Both events are archaeologically visible.

Whenever possible, the excavated features were sampled for botanical remains. In general such remains are carbonized, because most of the features are well above the watertable. Uncarbonized plant matter would not have been preserved under such circumstances. Wells offer the exception. If they still reach below the watertable, fruits and seeds are preserved by waterlogging. Unfortunately not every well bottom was lying deep enough to have stayed wet since the well was dug. Lowering of watertables in the distant, but more often in the fairly recent past has destroyed the organic contents of quite a number of old wells. Nevertheless, enough wells with waterlogged contents were found. This is fortunate, because remains of vegetables, condiments and fruits are better preserved in this way. Carbonized matter provides mostly insight into cereals, pulses and, to a lesser extent, oil seeds.

The result of all the sampling is that a number of data have become available to answer questions. The questions

put forward in this paper refer to the events mentioned earlier:

- Did the inclusion of the region in the Roman Empire have any impact on the choice of crops cultivated by the indigenous population?
- What happened to crop cultivation after the collapse of the Roman Empire?

The region covered in this paper is bordered on its northern and eastern side by the river Meuse, which implies that not only parts of the province of Noord-Brabant are studied but a small part of the province of Limburg as well. Its southern and western limits are rather arbitrarily drawn (fig. 1).

2 The geological and geographical background

The deeper subsoil of the region consists of gravels and sands deposited by the river Meuse during the Early and Middle Pleistocene. During the cold phases of the Late Pleistocene these deposits were covered by wind-blown sands originating from surfaces lying bare of vegetation. Such sands are called 'cover sands'. They are wanting in lime and loam, though the loam fraction may vary from place to place. Nevertheless it is nowhere very important. At present cover sands lie at the surface in most of the region, as they did during the entire Holocene. Holocene additions are loamy deposits in the valley of streams, an important stretch of oligotrophic peat, relatively small patches of wind blown sands caused by deforestation, and the man-made *plaggen* soils. The latter are the result of manuring fields with sods (*plaggen*) mixed with dung and household waste. This kind of manure contains a considerable amount of mineral matter and its use has raised the surface of the fields noticeably, but as this practice dates from a period after the period considered in this paper, *plaggen* soils were not yet in evidence at that time (Spek 2004, 800 and 807).

Since their deposition the cover sands have undergone the process of podzolisation. The resulting podzol type depends on the vegetation history of the different parts of the region and its history is still a subject of research.

The region is drained by a series of small streams which discharge into the large river Meuse. They are arranged in two systems, one running in a northerly direction and one in a more easterly direction. Most of the cover sand plateaus between the streams are characterised by a low watertable. Only near the streams is the watertable higher. But there are two exceptions. The most important one is the watershed between two drainage systems. Because the cover sands were delivered by winds blowing from the North and did not settle evenly but in low east-west running ridges, the streams running in a northerly direction were not successful in draining the parts of their area in their upper courses. The result was stagnation of run-off, which in its turn led to peat growth. During the period under review a vast peat, known as De Peel, covered this part of the region.

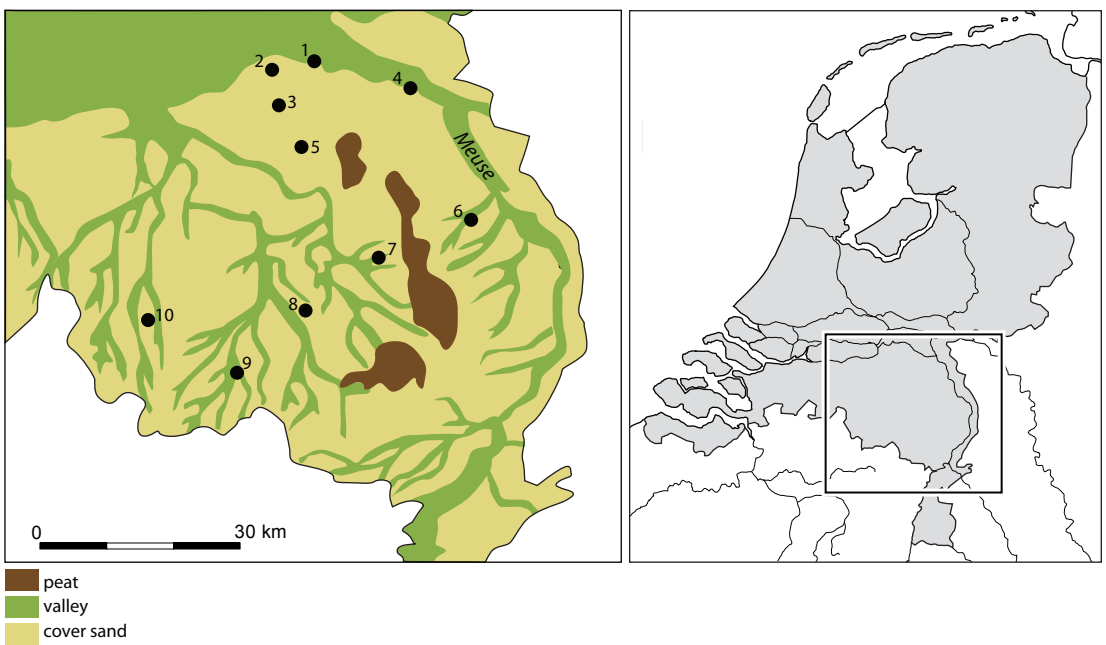

Figure 1 Map with the location of the sites mentioned in the text. 1 Herpen, 2 Oss, 3 Nistelrode, 4 Cuijk, 5 Uden, 6 Venray, 7 Bakel, 8 Geldrop, 9 Dommelen, 10 Hoogeloon.

The other exception are places where artesian seepage maintains marshy patches in the landscape. This seepage has its origin in the tectonics of the region, where deep-lying faults provide discontinuities in the sediment layers. Tectonic movements are still occasionally felt, but they are not strong enough to have had a serious effect on the population's lives and actions.

In the period 500 BC – AD 1250 the rural population lived on the cover sand plateaus, not exactly in their centres but also not on their immediate edges. Streams were never far off, but nevertheless the people did have to rely on wells for their water. If there was anything to choose, they opted to settle on cover sands with some content of loam (Roymans and Gerritsen 2002).

3 The plants grown

3.1 The Middle and Late Iron Age (500 BC – 19 BC)

The crops grown by the Iron Age farmers were emmer wheat (*Triticum dicoccum*), spelt wheat (*Triticum spelta*), hulled multi-rowed barley (*Hordeum vulgare* var. *vulgare*), oats (*Avena sativa*), broomcorn millet (*Panicum miliaceum*), pea (*Pisum sativum*), horsebean (*Vicia faba* var. *minor*), flax (*Linum usitatissimum*), gold of pleasure (*Camelina sativa*), rape seed (*Brassica rapa*), and opium poppy (*Papaver somniferum* var. *setigerum*) (Bakels and van der Ham 1980; Bakels *et al*. 1997).

In some settlements the status of oats as a crop plant is questionable, because identifiable chaff remains are lacking. Grains of oats cannot be distinguished from wild oat (*Avena fatua*), a weed in cereal fields. Rye (*Secale cereale*) in this region was not yet a crop, as distinct from sites north of the river Meuse (Lauwerier *et al*. 1998-99).

All plants are known from carbonized and/or waterlogged remains, whilst additional information is provided by impressions of seeds and chaff in ceramics. They present quite a list, but what strikes the eye is that all plants are annuals. Of course, the list is biased because the ways of preservation exclude the discovery of plants grown for their leaves, roots and bulbs, which are neither preserved by carbonization nor by waterlogging, but this fact does not explain why perennial species have not been found. What is also clear is that the crops were grown to provide cereals, pulses, oil seeds and fibers. Plants grown for flavour or medicinal use are absent from the records. Missing too are plants providing dye stuffs. It is possible that such plants are not found, because they are used in the form of leaves or roots, but if they were grown on any scale at least some of their seeds, for instance seeds destined for sowing or seeds from plants run to seed, might have been preserved. Also, some condiments and medicines are seeds. The conclusion must be that the Iron Age farmers grew only staple crops. Other products, such as fruits, nuts and herbs were obviously collected from wild stands, if and when needed.

3.2 The Roman period (19 BC – AD 250)

Mediterranean habits were quite different. Farmers in Italy, for instance, planted fruit and nut trees, and cultivated vegetables in gardens. Some of their products, especially condiments, arrived together with other southern products such as luxury ceramics in regions north of the Mediterranean long before the arrival of Roman armies (Bakels 2009, 104). They are found in northern France and southern Germany and are considered as medicine. Instances of such plants are celery (*Apium graveolens*) and fennel (*Foeniculum vulgare*). There are no indications that these were actually grown in these regions.

The arrival of Roman troops altered this situation. The army people, and especially their officers, could obviously not live without their customary foods. Immediately after the Roman invasion exotic plants turn up in the archaeological records, a phenomenon observed in many European sites which before were situated well outside the sphere of Mediterranean influence (Bakels and Jacomet 2003). The civilian administrators who followed shortly after, shared the culinary demands of the army people.

At first all products foreign to the conquered regions had to be imported, and this phase lasted some 50 to 70 years. But later on everything that could be grown locally, was grown locally. Roman style farms sprung up, known as *villae rusticae*. This new development is found almost everywhere, but there are regions where the *villa rustica* did not take. One of these is the region under review here. One reason put forward is that Brabant formed a hinterland of the Roman frontier, the *limes* (Slofstra 1991, 137). But against this explanation can be said that elsewhere in Europe the *villa rustica* became very popular in regions along the *limes*. Slofstra offers another possibility, namely that the nature of the soil hampered the rise of the Roman style farm. A development in the direction of a *villa* took place during the 2nd century, but the process seems to have come to a standstill at the level of the so-called *native-style villa*, which is a traditional type of house with some external features of a *villa* such as a wooden portico and a tiled roof. Formerly these buildings were called *proto-villa*, i.e. something that never reached the stage of a true *villa*, but now they are considered to represent a new local architectural design (Slofstra pers. comm.). Only one farmstead has the characteristics of a true *villa rustica* of modest size: the *villa* of Hoogeloon.

Farmers producing in a classic *villa rustica* setting planted orchards and maintained vegetable gardens (Bakels and Jacomet 2003). Such specialized plots of land were neither detected in connection with the *villa* of Hoogeloon, nor with the *native-style villae*. Nevertheless, the indigenous farmers did incorporate some 'Roman' food plants into the range of plants to be grown. The most reliable evidence of this is provided by finds of fruits of beet (*Beta vulgaris*) (fig. 2).

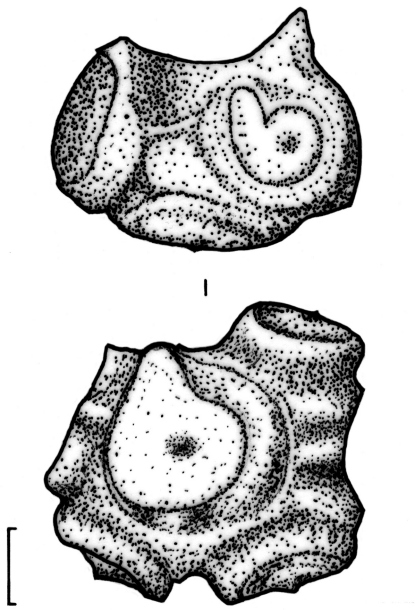

Figure 2 Fruit of beet (*Beta vulgaris*), provenance Oss. Scale bar 1 mm. Drawing W.J. Kuijper.

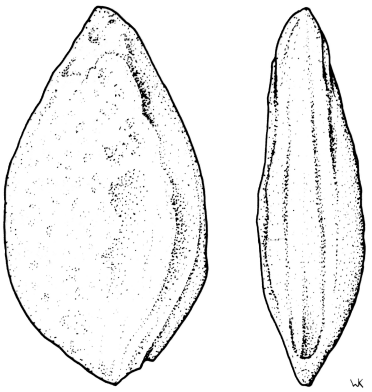

Figure 3 Plum stone (*Prunus domestica* var. *insititia*), provenance Oss. Length 16 mm. Drawing W.J. Kuijper.

Although wild beet does grow in specific places along the North Sea coast, it does not occur in Brabant and was certainly not gathered in the natural environment. The origin of the cultivated beet lies around the Mediterranean Basin and it is common opinion that the Romans introduced beet north of the Alps (Zohary and Hopf 2000, 201). Beet fruits were found in several Roman Iron Age settlements, Oss-Zomerhof, Oss-Vijver, Oss-Westerveld and Hoogeloon for instance. As beet is cultivated for its root and/or leaves, and harvested before seed-setting, it is supposed that its remains have hardly any chance to be found during an excavation. The fact that its fruits were found at all is an indication that beet was much more common than the find of a few fruits seems to suggest.

Beet is not the only 'Roman' species in rural contexts. Also found were dill (*Anethum graveolens*), celery (*Apium graveolens*), coriander (*Coriandrum sativum*), parsley (*Petroselinum crispum*), savory (*Satureja hortensis*), plum (*Prunus domestica* var. *insititia*) and walnut (*Juglans regia*) (fig. 3). Unlike beet, these plants have only been found in connection with a *villa* or *native-style villa*. They may have been imported as seed or nut and it is therefore not certain that the owners of those *native-style villas* did cultivate condiments and planted trees. But as these plants were being cultivated at that time elsewhere in a *villa* setting, it is quite possible that they were cultivated in Brabant too. Nevertheless, some products must have been imported. The fig seeds (*Ficus carica*) retrieved from Hoogeloon cannot have been a local product, because the local climate is not very well suited to the ripening of figs. However that may be, it seems that local farmers adopted some of the new food plants, though perhaps slowly.

Romanization of the rural population is held to have been brought about mainly by local people who had served in the Roman army and had returned after a considerable number of years of service (Slofstra 1991). Service in the army was a common phenomenon and the removal of many able-bodied men must have had a considerable effect on the farming communities as Van Driel-Murray (2008) has pointed out. Typical male tasks such as ploughing would have caused grave problems. Cultivation of large fields may have become difficult. Van Driel-Murray thinks that cultivation shifted from farming fields to an emphasis on horticulture. Small plots are manageable by women, children and elderly people, precisely those who were left behind. This shift to gardening is not recognized in the archaeological records, but a lightly fenced garden and its crop may not have left any trace at all. Nevertheless one remarkable change is noticed: the rural population left more remains of wild fruits and nuts behind than their Iron Age predecessors (fig. 4). It may be going too far to explain the repeatedly occurring remains of black berries (*Rubus fruticosus*), raspberries (*Rubus idaeus*), bilberries (*Vaccinium myrtillus*), sloe plums (*Prunus spinosa*), and hazelnuts (*Corylus avellana*) as deriving from horticulture, but it looks as if gathering had become more common than before.

The essential crop plants – cereals, pulses and oil seeds – remained the same as before the arrival of the Romans but for one species: gold of pleasure (*Camelina sativa*) disappears from the records as a main crop. The reason is not clear, but the decline of gold of pleasure cultivation is not restricted to Brabant. It is a common phenomenon in Central and Western Europe (Knörzer 1978).

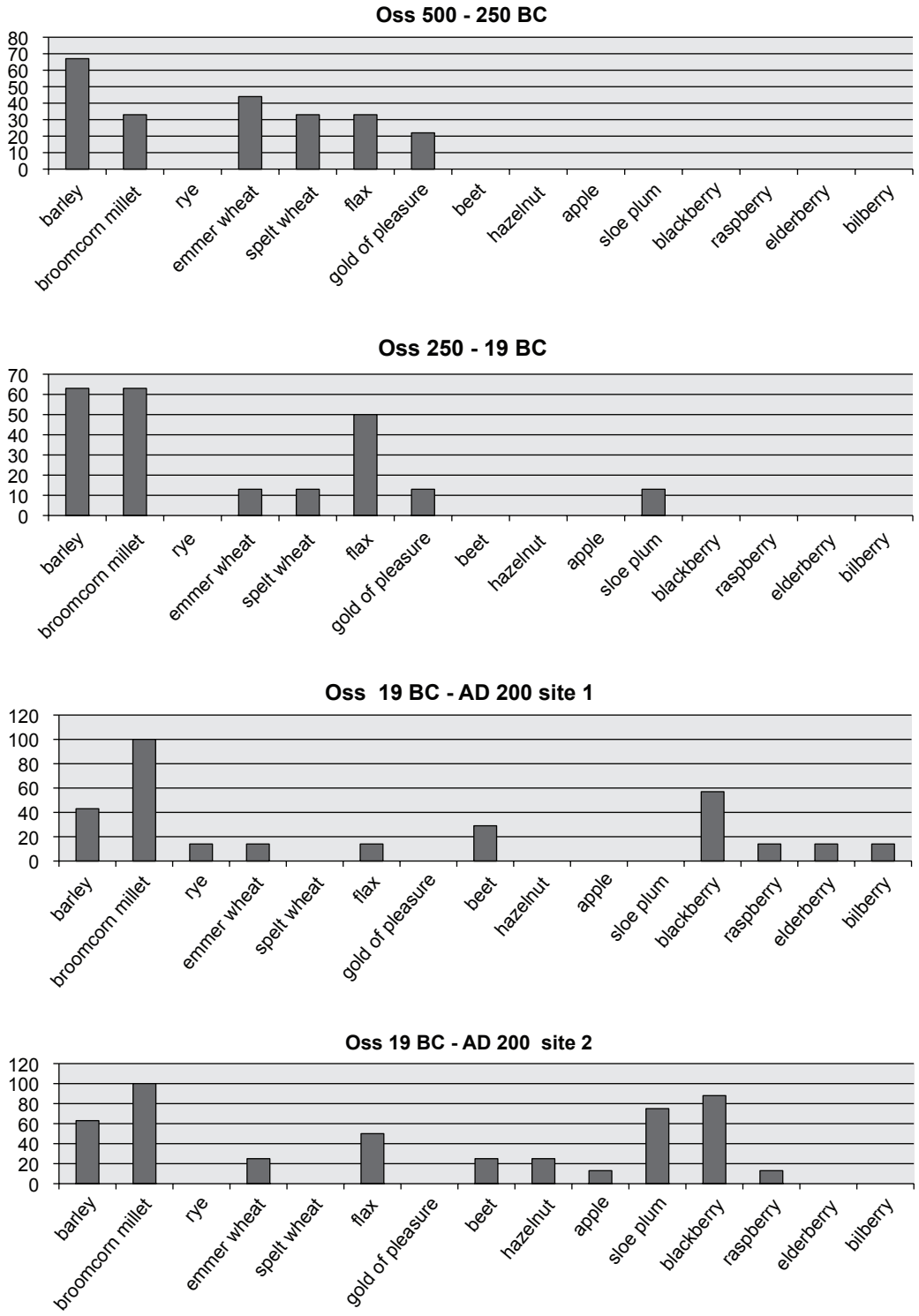

Figure 4 The occurrence and importance of cultivated and gathered plants in Oss at four different residential units belonging to three different periods. The importance is expressed in frequency i.e. the percentage of samples in which the plant was found.

One site revealed two grains of bread wheat (*Triticum aestivum*), prompting the thought that another cereal was added to the list of staple crops, but this is probably a false conclusion. This bread wheat was found in Hoogeloon, which is the site with the highest level of Romanization and presumably the richest inhabitants of the region (van Beurden 2002b). Bread wheat is a rather exacting cereal and does not do well on the local sandy soils. It is a wheat considered always and everywhere as a kind of superior cereal and was probably a luxury in Brabant. It may have been imported from other parts of the Roman Empire, upstream the river Meuse for instance, where conditions for wheat growing were optimal.

3.3 The Early and High Middle Ages (AD 500 – AD 1250)

The title of this section suggests a gap of some 250 years between the end of Roman rule and the beginning of the Middle Ages. The problem is that our knowledge of what happened exactly in the countryside during the period of the decline of the Roman Empire is still somewhat hazy. Rural settlement close to the northern border of the region under review disappears around AD 250 (Wesselingh 2000, 248). Pollen diagrams show that part of the land returned to woodland, but human presence did not entirely disappear (Teunissen 1988; van Beurden 2002a). More inland, a farming population lingered on, but the only Late Roman site unearthed and archaeobotanically investigated, Geldrop-'t Zand, is a settlement of newcomers: members of a Germanic tribe, presumably Franks (Bazelmans 1990). It is known that Germanic tribes crossed the Roman border, invited to do so to help in maintaining the peace, or not invited at all.

The Germanic tribes introduced a new staple crop: rye (*Secale cereale*). Although some grains of rye were detected before this time, it is only from the late 4th-5th century onwards that this cereal has to be regarded as a main crop. Geldrop-'t Zand provided an example (Luijten 1990). The connection German tribes – rye is not restricted to Brabant. The advance of this cereal associated with the decline of Roman authority is also seen in other regions such as the German Rhineland and northern France (Bakels 2009). Although rye does very well on poor soils, the principal reason for the success of rye must not be attributed to the sandy soils of Brabant. The consumption of rye must have been part of the Germanic culture.

The settlement of Geldrop-'t Zand further revealed remains of hulled multi-rowed barley (*Hordeum vulgare* var. *vulgare*), broomcorn millet (*Panicum miliaceum*) and bread wheat (*Triticum aestivum*).The first two mentioned were already grown earlier in the region. As mentioned before bread wheat is another matter. Just as in Roman period Hoogeloon it is considered an import (Luijten 1990). The Frankish settlers in Geldrop obviously maintained good connections with people living in regions where bread wheat was a common crop. Possibly some members of the Geldrop families were still very mobile, presumably as military men.

It is unfortunate that not much more is known about crops grown during the 4th and 5th centuries. The thread is picked up again at the end of the 6th-beginning of the 7th century. Rye (*Secale cereale*) is firmly established as a main crop and has held this position not only during the Middle Ages, but also well into the 20th century. Rye is the commonest find, followed by hulled multi-rowed barley (*Hordeum vulgare* var. *vulgare*) and oats (*Avena sativa*) (table 1). From two-rowed barley (*Hordeum distichum*), which was known in Europe at that time, there is no trace. The oats is, as far as could be ascertained from the chaff, *Avena sativa*. Wild oat (*Avena fatua*) was present as well, but a second possible cultivated oats species, bristle oat (*Avena strigosa*), has not been detected so far. From medieval written sources it is known that bristle oat was grown in Brabant, but as these sources date to the 14th century and later, they are not of much relevance to our study.

Broomcorn millet (*Panicum miliaceum*) came far after the three main cereals. The great absentees are the wheats. Spelt wheat (*Triticum spelta*) has vanished from the records. One fragment of emmer wheat chaff (*Triticum dicoccum*) in a 11th century context and one single grain in a 12th century context cannot be considered as proof of emmer cultivation. This wheat may have dwindled into a weed in cereal fields. Bread wheat (*Triticum aestivum*) provides a different story. Two of the sites lie at the edge of the area with the sandy soils where these border the loams deposited by the river Meuse. It is quite possible that the farmers of these sites, Herpen-Wilgendaal and Cuijk-De Beijerd en 't Riet, tilled also land on the river-loams in the higher parts of the Meuse valley. Soils there must have been better suited to bread wheat growing. The few grains retrieved from Dommelen are as yet unexplained.

Pea (*Pisum sativum*) and horse bean (*Vicia faba* var. *minor*) are occasionally found, indicating that those pulses, already grown in the Iron Age, were still being grown. New is lentil (*Lens culinaris*), a pulse that is not very well suited to the climate of the region. As lentil was found in 11th century Herpen, a site not far from the river Meuse, it may be questioned whether it was perhaps not grown locally but imported from more southern regions. Much traffic went by water. By the way, this may also apply to the bread wheat mentioned earlier. The fact that pulses are only occasionally found, leads to the assumption that pulses were only of secondary importance. Their relative absence cannot easily be attributed to a different kind of preservation in comparison with the cereals, because in other regions of Western Europe pulses were much more in evidence (Bakels 2005).

Linseed, and with it flax (*Linum usitatissimum*), is also not frequently present in the archaeobotanical samples, but its remains are more common than those of pulses and come second after the cereals. Written sources dating from the late Middle Ages tell us that flax and linseed were important products, and this may have been the case in the high Middle Ages as well (Bieleman 1992, 99). Rapeseed (*Brassica rapa*) seems to have remained a fairly common crop too, but finds of opium poppy (*Papaver somniferum*) are restricted to Dommelen for the moment.

Table 1 lists two crop plants which have not been mentioned earlier: buckwheat (*Fagopyrum esculentum*) and hop (*Humulus lupulus*). The status of buckwheat in this period is still open to debate. Found was only one fruit and some pollen. As buckwheat is considered to have become a true crop in Brabant not earlier than in the Late Middle Ages, the few buckwheat remains are hard to interpret. The inclusion of hop in the list may be questionable too. On the one hand, written sources tell us that growing hop was of considerable importance during the late Middle Ages. It was cultivated for flavouring and preserving beer. On the other hand, natural stands of hop can be found in the valleys and on the wetter fringes of the sandy region.

What survived of the Roman vegetables and fruit trees? Beet (*Beta vulgaris*), dill (*Anethum graveolens*), celery (*Apium graveolens*), savory (*Satureja hortensis*) and amaranth (*Amaranthus lividus*) are witnesses to the existence of kitchen gardens. Amaranth has not yet been mentioned, but this plant, used as spinach, belongs also to the Roman set of vegetables.

The remains of fig (*Ficus carica*) and grape (*Vitis vinifera*) are presumably not of local origin. As remarked earlier, figs do not ripen readily in the region and the pips must be the remnants of imported dried figs, valued because of their intense sweetness. In the same light the presence of grape pips may be explained. Although it cannot be excluded that vines were cultivated, it is much more probable that the grape pips came from imported raisins. The orchard remains a questionable part of the farms. It is surprising how few remains of cultivated fruits and nuts are found in rural sites. A few plum stones (*Prunus insititia*) reveal the presence of plum trees. Some apple pips (*Malus* sp.) may have come from cultivated apples, but as their pips cannot be distinguished from those of the wild crab apple, it cannot be proven that the farms boasted apple trees. Of walnuts there is no trace so far. It may be wondered whether the medieval farms in Brabant had orchards at all. Perhaps a restricted number of fruit trees was growing in their yards. The remainder of the fruits still came from harvesting berries and nuts from wild shrubs in the local environment.

Taking all together, it may be concluded that the main crops grown by the early-medieval Brabant farmers were rye, barley and oats. They are the crops most often found, not only in numbers but also when looking at the percentage of features and samples in which they were discovered. Flax/linseed may also have been of some importance, but the remainder was grown as a sideline.

4 More about crops

4.1 Monocrops or maslins

Farmers can sow one type of crop on a field or a mixture of crop plants. In the first case a monocrop is being produced whilst the second practice leads to mixtures called maslins. Mixed sowing is a way to avoid risks. When one component fails another may still do well.

To learn whether maslin or monocrop growing was practised remains of single harvests are needed. Such finds are rare, but some instances of concentrations of carbonized seeds may be interpreted as such. One is a concentration of emmer wheat (*Triticum dicoccum*) found in Roman period Oss-Horzak. It was retrieved from a well and therefore not in primary position, but as almost all other plant species found in its fill were waterlogged it can be safely concluded that they are not related to the wheat concentration (Chen 2005). The only other carbonized components were barley, which amounts to 0.2 % of a total of over 50,000 cereal grains, and four grains of oats. The emmer wheat was still enclosed by its husks. The conclusion is that this find represents a monocrop of emmer wheat. The other cereals may have been lying around in the place where the emmer was exposed to a damaging heat, or may have grown in the emmer field as offspring of the crop of the year before. Grains lost during harvesting may germinate next year and thrive as a kind of weed in the next crop.

Another instance is a burnt-down outhouse in Roman period Venray-Hoogriebroek (Hänninen 2000). Its postholes were filled with carbonized matter that is considered to represent the crops stored there (fig. 5). In one corner they revealed a concentration of barley (*Hordeum vulgare* var. *vulgare*), in another place a concentration of broomcorn millet (*Panicum miliaceum*), and in a third place wild herbs. Emmer wheat (*Triticum dicoccum*) was more evenly distributed. Hänninen's conclusion is that barley and broomcorn millet were stored separately, in bags or baskets, and that emmer wheat was lying more dispersed, because it was stored in loose heaps and became scattered. It is clear that barley and broomcorn millet were kept apart and were also harvested apart, which does support the status of monocrop for both.

Analysis of a burnt-down house in Hoogeloon revealed a posthole filled with unthreshed barley (*Hordeum vulgare* var. *vulgare*). Other postholes contained remnants of hay (van Beurden 2002b). The find demonstrates that the barley was grown as monocrop.

century	end 6th start 7th	merov	merov	carol	carol	8th-9th	end 9th start 10th	10th	10th-11th	second half 10th - 11th
site	Cuijk	Geldrop	Dommelen	Geldrop	Dommelen	Uden	Bakel	Bakel	Dommelen	Nistelrode
cultivated										
oats	–	–	■	■	■	■	–	■	■	■
barley	■	■	■	■	■	■	–	■	■	■
rye	■	■	■	–	■	■	■	■	■	■
bread wheat	–	–	■	■	■	–	–	–	■	–
broomcorn millet	–	–	–	■	■	–	–	–	–	■
emmer wheat	–	–	–	–	–	–	–	–	–	–
buckwheat	–	–	■	–	–	–	–	–	–	–
lentil	–	–	–	–	–	–	–	–	–	–
pea	–	–	–	–	■	–	–	–	–	–
horsebean	–	–	■	–	–	■	–	–	■	–
linseed/flax	–	■	■	■	■	–	–	–	■	–
opium poppy	–	–	–	–	■	–	–	–	–	–
rapeseed	–	■	–	–	–	■	–	–	■	–
hop	–	–	–	–	■	–	–	–	–	–
cultivated Roman origin										
beet	–	–	–	–	–	–	–	–	–	–
amaranth	–	–	–	–	–	–	–	–	–	–
dill	–	■	–	–	–	–	–	–	–	–
celery	–	–	–	–	–	–	–	–	–	–
savory	–	■	–	–	–	–	–	–	–	–
plum	–	–	–	–	■	–	–	–	–	–
grape	–	–	–	–	–	–	–	–	■	–
wild fruits and nuts										
hazelnut	–	–	–	–	■	■	–	■	–	■
sloe plum	–	–	–	–	–	–	–	–	–	–
raspberry	–	–	–	–	■	■	–	–	■	–
blackberry	–	■	–	–	■	■	–	–	■	–
elderberry	–	–	–	–	–	–	–	–	–	–
blueberry	–	–	–	–	–	–	–	–	–	–
possibly wild										
gold of pleasure	–	–	–	–	–	–	–	–	–	–
apple/pear	–	■	–	–	■	–	–	–	–	–

Table 1 The cultivated and gathered plants found in medieval sites on the sandy soils of Eastern Brabant.

end 10th 11th Bakel	11th Cuijk	11th Nistelrode	11th Herpen	first half 12th Uden	second half 12th Nistelrode	second half 12th Cuijk	12th Dommelen	first half 13th Cuijk	13th Dommelen	
■	■	■	■	–	–	■	■	■	■	Avena sativa
■	■	■	■	–	■	■	■	■	■	Hordeum vulgare, hulled
■	■	■	■	■	■	■	■	■	■	Secale cereale
–	■	–	■	–	–	■	–	■	■	Triticum aestivum
–	■	–	–	–	–	–	■	–	–	Panicum miliaceum
–	–	■	–	–	■	–	–	–	–	Triticum dicoccum
–	–	–	–	–	–	–	■	–	–	Fagopyrum esculentum
–	–	–	■	–	–	–	–	–	–	Lens culinaris
–	–	–	■	–	–	–	■	–	■	Pisum sativum
–	–	–	–	–	–	–	■	–	■	Vicia faba var. minor
■	–	■	–	–	–	■	■	■	–	Linum usitatissimum
–	–	–	–	–	–	–	■	–	–	Papaver somniferum
–	■	–	■	–	–	–	–	–	–	Brassica rapa
–	■	■	■	–	–	–	■	–	–	Humulus lupulus
–	–	■	■	–	■	–	–	–	–	Beta vulgaris
–	–	■	–	–	–	–	–	–	–	Amaranthus lividus
–	–	–	–	–	–	–	–	–	–	Anethum graveolens
–	–	■	–	–	–	–	–	–	–	Apium graveolens
–	–	–	–	–	–	–	–	–	–	Satureja hortensis
–	–	–	–	–	–	–	■	–	■	Prunus insititia
–	–	–	–	–	–	–	–	–	–	Vitis vinifera
–	–	■	■	–	■	–	■	■	–	Corylus avellana
–	■	–	–	–	–	–	–	–	–	Prunus spinosa
–	–	–	■	–	–	–	■	–	–	Rubus idaeus
–	■	■	■	–	■	–	–	■	■	Rubus fruticosus
–	■	■	■	–	■	–	–	–	■	Sambucus nigra
–	–	–	–	–	–	–	■	–	–	Vaccinium myrtillus
–	–		–	–	–	–	–	–	■	Camelina sativa
–	–	■	–	–	–	–	■	–	–	Malus sp.

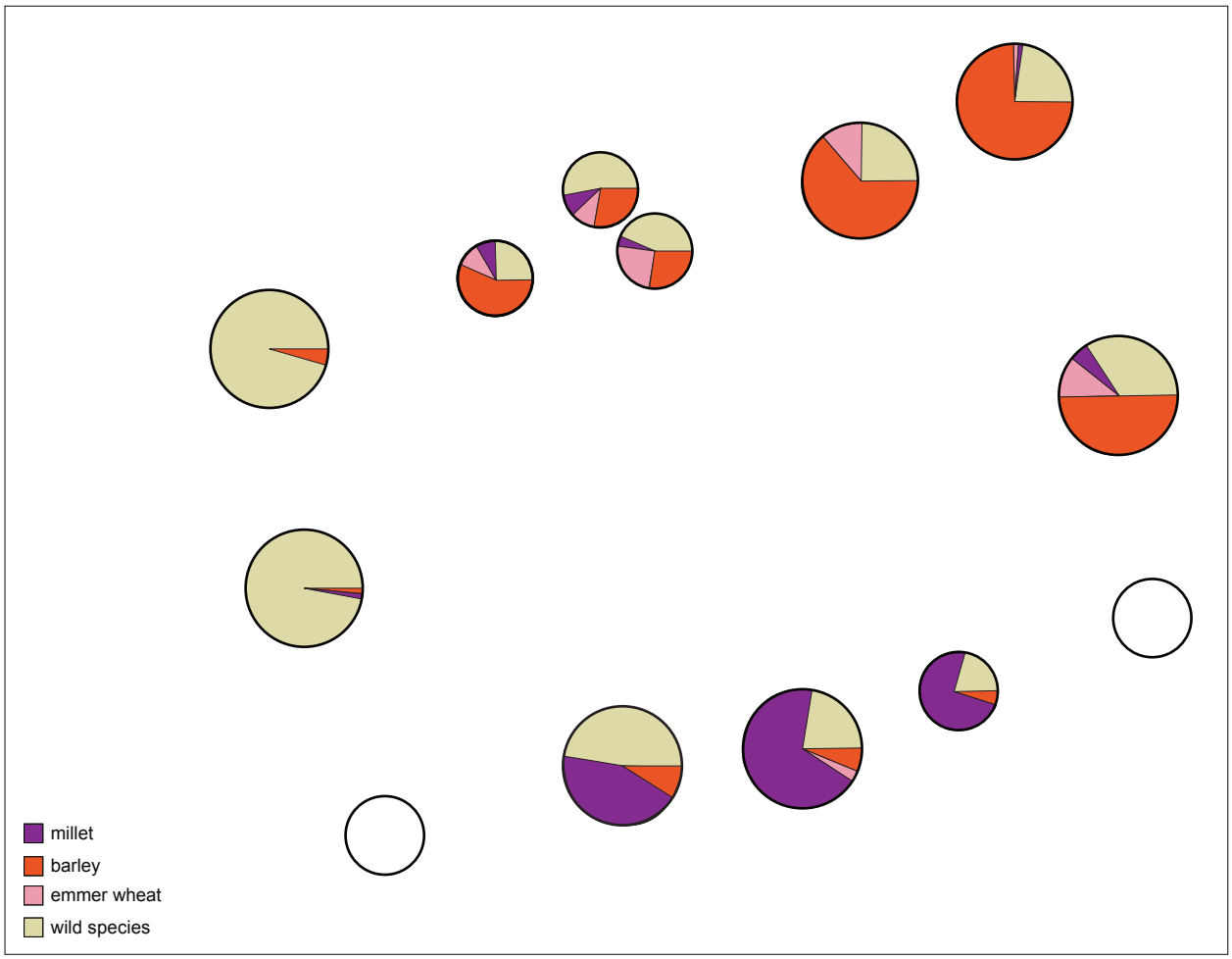

Figure 5 The composition of the plant remains found in the postholes of the outhouse at Venray-Hoogriebroek. Postholes left white were not sampled.

Postholes of a burnt-down outhouse in 8th-9th century Uden show that oats (*Avena sativa*), rye (*Secale cereale*), and, less obvious, barley (*Hordeum vulgare* var. *vulgare*) were stored apart (fig. 6). There is no question of maslins (Bakels 2007).

Other instances of charred harvests were retrieved from Bakel-Achter de Molen, Herpen-Wilgendaal and Dommelen. The outhouse in Bakel, mid 10th century, contained only barley (*Hordeum vulgare* var. *vulgare*). Two other structures in Bakel contained rye straw (*Secale cereale*) and hay (Bakels 2007). The 11th century find from Herpen consisted of oats (*Avena sativa*) and the 12th century find from Dommelen rye (*Secale cereale*) (Bakels 2007; Pals 1988). These finds show that the growing of maslins was not practised, at least not regularly.

Remains of pure harvests may also offer indications of crop rotation, as was mentioned earlier concerning the emmer wheat found in Oss-Horzak. The slight contamination with barley – the oats may represent the weed wild oat – may refer to an earlier crop of barley on the same field. Nevertheless, the indication is too weak to allow conclusions. As there are no other instances of 'closed' finds of harvests – none of the concentrations mentioned above having this quality – reliable information on any form of crop rotation is lacking.

4.2 Poor soils?

Single harvests offer another opportunity: the weeds mixed in offer an insight into the quality of the soil on which they were grown. For this kind of analysis the quality of 'closed find' need not to be applied as strictly as for the identification of crop rotation, as long as the crops are considered to have been grown on the same field or set of fields. The rye from

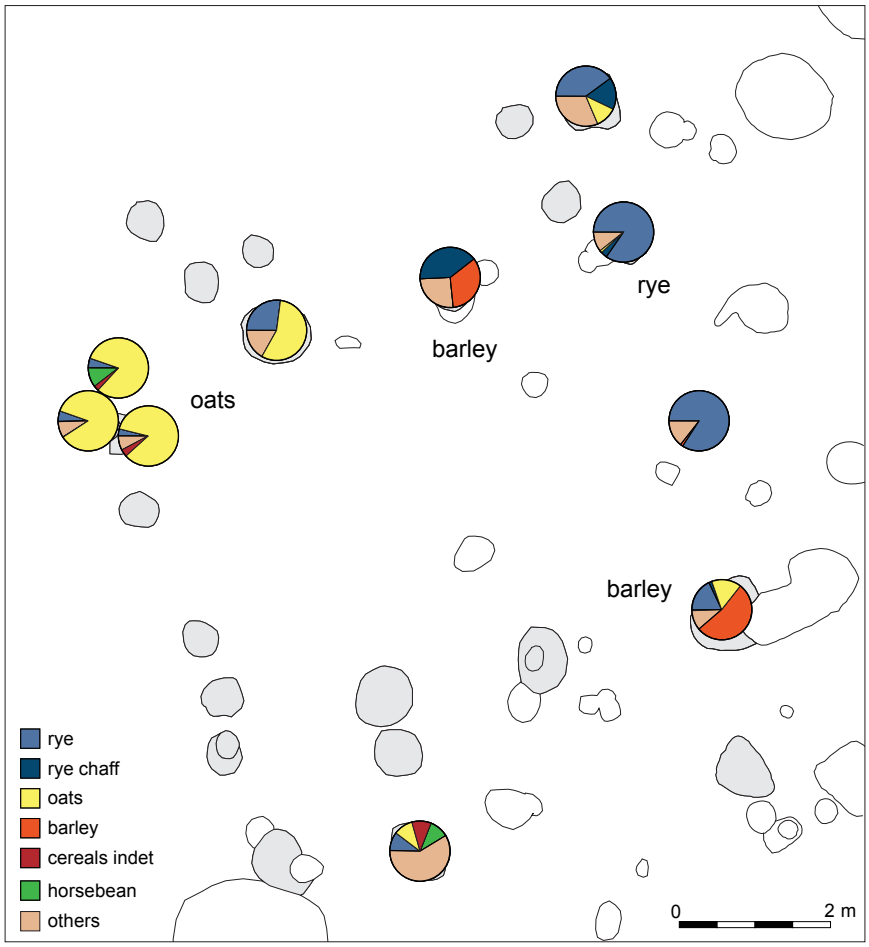

Figure 6 The composition of the plant remains found in the postholes of the outhouse at Uden.

Uden, barley from Bakel and oats from Herpen held a sufficient number of weeds identified to species level, to try an identification of the weed flora.

It is sometimes stated that the modern phytosociological classifications are not valid when dealing with former vegetations, especially when these are of a man-made nature, such as the weed vegetation of fields. Essentially this view is correct. Weeds are thus dependent on the way fields are tilled and crops are handled that changes in these practices in the course of time are causing changes in the composition of the weed flora. Viewed in this light, it is astonishing that in practice fitting medieval weeds into modern classifications appears to make sense. Most of the diagnostic species were present by that time and tillage seems not have been that different from the first half of the 20th century practices, which was the period in which the basis of the phytosociological weed classification was laid down.

The result of the fitting is shown in table 2. The Roman period site of Hoogeloon is entered as well. The best fit for the harvests discussed in this paper is found in the class *Stellarietea mediae* Tüxen, Lohmeyer et Preising in Tüxen 1950. The species entered are few in number because only such can be expected to be found during excavations in settlements as were brought in with the harvest, survived contact with fire or heat, and could after carbonization still be identified. The short list of diagnostic plants contains several species characteristic of the class as a whole, namely *Fallopia convolvulus*, *Stellaria media*, *Chenopodium album* and *Bromus secalinus* (Haveman *et al*. 1998). The others belong to its order B: *Sperguletalia arvensis* Hüppe et Hofmeister 1990, with an emphasis on its alliance *Digitario-Setarion* Sissingh in Westhoff et al. 1946 em. Hüppe et Hofmeister 1990. Such vegetations are indicative of non-alkaline, mostly acid sandy or loamy soils, which

Class 30									
Order	A	A	A	A	A	B	B	B	B
Alliance	a	a	b	b	b	a	a	b	b
Association	1	2	1	2	3	1	2	1	2
Hoogeloon, 2nd c., barley									
Fallopia convolvulus	■	■	■	■	■	■	■	■	■
Stellaria media	■	■	■	■	■	■	■	■	■
Spergula arvensis	■	■	■	■	■	■	■	■	■
Hypocharis glabra								■	
Uden, 8th–9th c., rye									
Fallopia convolvulus	■	■	■	■	■	■	■	■	■
Vicia hirsuta						■	■		
Galeopsis segetum						■			
Hypochaeris glabra								■	
Bakel, 10th c., barley									
Fallopia convolvulus	■	■	■	■	■	■	■	■	■
Spergula arvensis						■	■	■	■
Scleranthus annuus									
Raphanus raphanistrum								■	
Echinochloa crus-galli									■
Herpen, 11th c., oats									
Chenopodium album	■	■	■	■	■	■	■	■	■
Spergula arvensis						■	■	■	■
Scleranthus annuus						■	■	■	■
Centaurea cyanus						■	■		
Vicia hirsuta						■	■		
Echinochloa crus-galli									■
Dommelen, 12th c., rye									
Fallopia convolvulus	■	■	■	■	■	■	■	■	■
Chenopodium album	■	■	■	■	■	■	■	■	■
Bromus secalinus	■	■	■	■	■	■	■	■	■
Spergula arvensis						■	■	■	■
Scleranthus annuus						■	■	■	■
Vicia sativa subsp. nigra						■	■		
Arnoseris minima						■			
Hypochaeris glabra								■	
Echinochloa crus-galli									■

Table 2 Weed species, characteristic of the *Stellarietea mediae* and its orders, alliances and associations, found in connection with crops retrieved from excavations.

tallies with the sandy soils of Brabant, when not heavily manured. It is a historical fact that manuring fields was always a problem in Brabant as dung was never available in the quantity demanded. Only artificial fertilizer could change, and did change, this situation (Bieleman 1992, 219).

From table 2 can therefore be concluded that the 2nd to 12th century farmers had difficulties in maintaining soil fertility. Iron Age farmers must have encountered the same problem, but no harvests with a sufficient number of weeds were available to prove this.

5 Discussion and conclusion

The first question put forward was whether the arrival of the Roman troops and the subsequent inclusion of the region in the Roman Empire had any effect on the crop choice of the local farmers. The answer is yes, but one effect was not expected beforehand and that was the rise in gathering activities. It is tentatively attributed to the absence of able-bodied men. More emphasis may have been put on a horticulture-like kind of agriculture. But the gardens were not stocked with a number of species introduced by the Romans. Only beet (*Beta vulgaris*) seems to have been generally adopted. Perhaps some plum trees (*Prunus domestica* var. *insititia*) and a few apple or pear trees (*Malus* sp./*Pyrus* sp.) were planted as well. It is striking that most finds of 'Roman' plants are associated with a *villa* or *native-style villa*. Even the parsley (*Petroselinum crispum*) of Venray-Hoogriebroek belongs to this class. Although no villa was excavated at the site, its debris – building stone, tiles etc. – were found in the excavated area and the original building must have been situated close by (Enckevort *et al*. 2000, 74.). Condiments, walnuts – and bread wheat – should probably be regarded as imports. As far as can be concluded, common local people did not adopt them. They may have nurtured a cultural aversion against new crops, but it is also possible that they shifted their activities to other subjects than crop growing.

Serving in the army may have been one thing, shifting to keeping more livestock may have been another, although of the latter there is no proof. Bone has problems with preservation in the sandy region. Nevertheless, ground-plans of farms provide some indication. Until the 2nd century ground-plans of farm houses remained the same; if they differ at all, it is in their length. From the 2nd century onwards part of the floor of the farmhouses in the southern part of the region is seen to have been deepened (fig. 7). Sunken floors are not observed everywhere in the region but they are a rather general phenomenon in farms built on the sandy soils of Brabant (van Beurden 2002b). The part where the floor was deepened is considered to represent the stable part of the house. A generally accepted interpretation is that lowering the floor would allow the accumulation of more

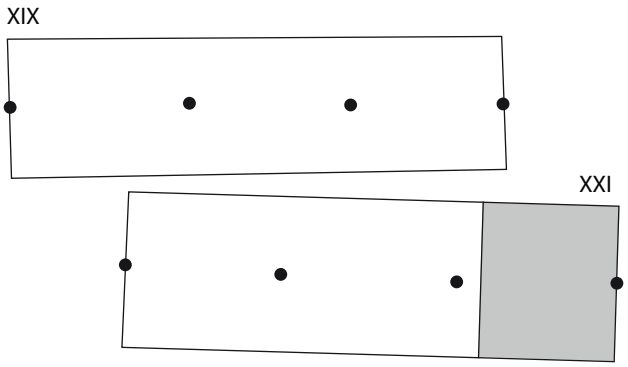

Figure 7 The plan of two farmhouses excavated at Hoogeloon. Indicated are the contour of their walls and the position of the roof-bearing posts (black dots). House XXI is the younger house and has presumably replaced house XIX. Part of its floor has been deepened (shaded area). House XXI measures 30 by 9 metres and house XIX 30 by 8 metres. Drawing after van Beurden 2002.

dung and making the collection of this dung easier (van Enckevort *et al*. 2000). Seen in this light it would have been a technological innovation and not a switch to an increasing emphasis on livestock keeping. But it may not have been a technical innovation alone. It may present a parallel to the increase of emphasis on horticulture. When there are no people available to look after herds grazing in the woods and rough pastures in the environment, the livestock should be kept at home, perhaps even for a prolonged time under the roof of the farmbuilding.

The second question concerned the withdrawal of direct Roman influence. Its first effect was a collapse of ordinary life in the rural hinterland of the Roman border. What happened exactly is not clear at all, but when the mist lifts farmers have abandoned wheat cultivation in favour of rye (*Secale cereale*) (fig. 8). This is a Germanic influence with roots in the culture of the Germanic tribes, in this instance the Franks. The shift is sometimes attributed to a change in climate around AD 250. Indeed, a change towards lower rainfall and/or lower temperature was demonstrated by, for instance, dendrochronology in Western Germany (Schmidt and Gruhle 2005). The period lasted until c. AD 400. Rye is a hardy cereal, but emmer wheat (*Triticum dicoccum*) is hardy too and has always remained a main cereal during all ups and downs of the climate since the beginning of crop cultivation in the region. A temporary worsening of the climate around AD 250 cannot have been the sole reason, if a reason at all, for the switch from emmer wheat to rye.

The plants introduced by the Romans were not quite lost. Old Frankish laws, such as the *Lex Salica* written down in the 6th century but as oral law much older, mention fruit trees outside and inside kitchen gardens (Eckhart 1969). But as

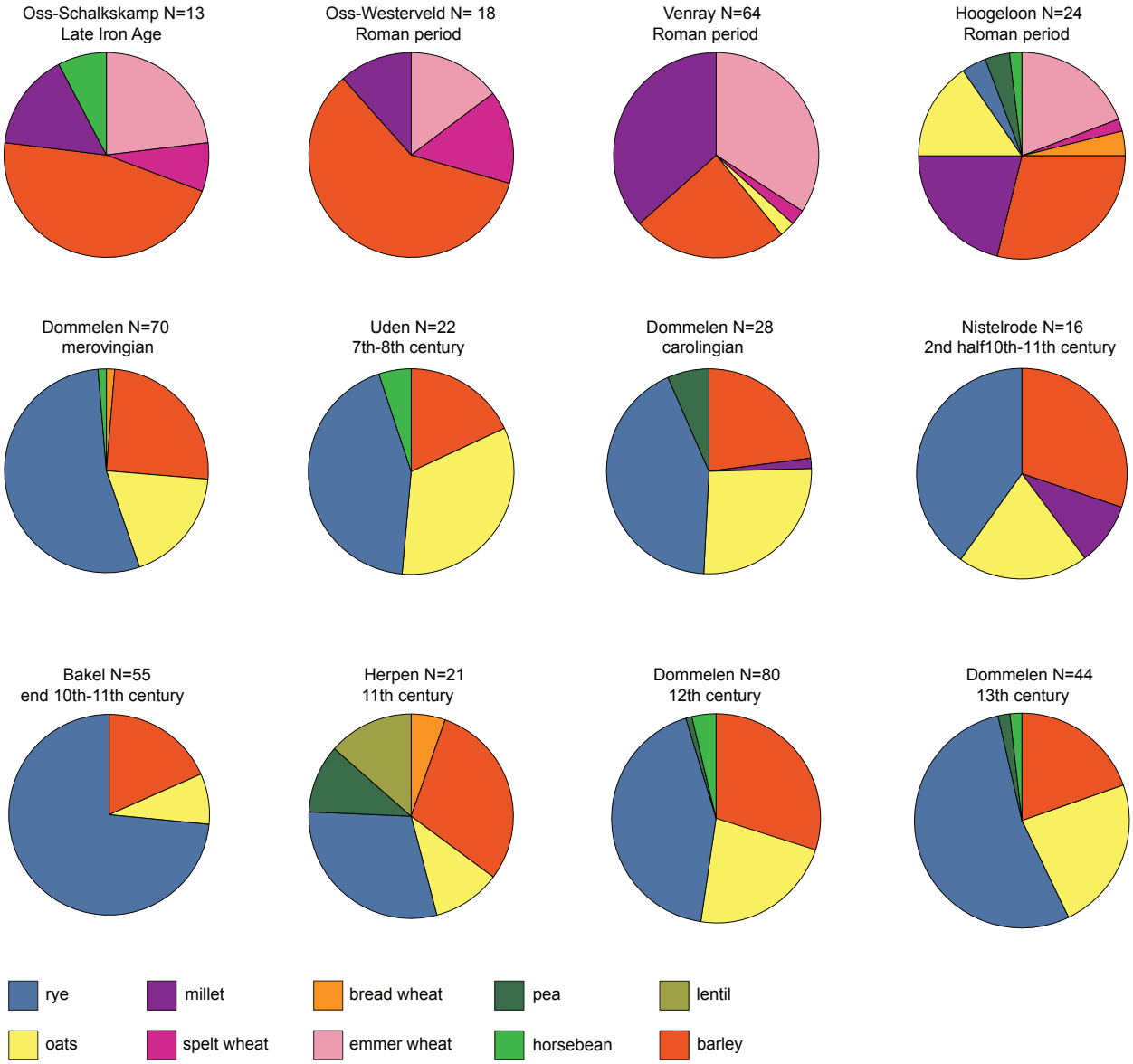

Figure 8 The composition of crops, based on their frequency, found during excavations in twelve sites. N represents the number of samples.

herbs and fruit trees were already not very popular during the Roman Period in the region, it remains to be seen whether and to which extent they were truly present on the farms on the sandy soils of Brabant. Probably the larger gardens and orchards were to be found attached to monasteries. Local farmers cultivated rye, barley, oats and flax and therefore still annual plants, not perennials, just as their prehistoric forebears.

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